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VEHICLE COMMUNICATION SYSTEM

RELATED APPLICATION

This application is related to and claims the benefit of earlier filed United States Provisional Patent Application Serial Number 60/461,600 entitled "VEHICLE COMMUNICATION SYSTEM," (Attorney Docket No. 02458), filed on April 9, 2003, the entire teachings of which are incorporated herein by this reference.

DETAILED DESCRIPTION

Fig. 3 includes a circuit description for an FM Audio Transmitter (12-volt version)

A microphone/earphone combination, such as is typically used for hands free cellular phone use, connects to a 2.5 mm audio jack on the end of an audio cable. The audio cable is connected to the PC board with the microphone positive lead connected to P3, the microphone negative lead connected to P2, which is ground, and the outer shield connected to P4 which is the antenna output. R3 supplies power to the microphone. The earphone is not used. The output of the microphone is amplified by U1. Amplifier U1 is configured as an inverting amplifier with a gain of two by resistors R5 and R9. Resistors

R10 and R11 form a voltage divider to provide a midpoint voltage of 2.5 volts at the positive input of amplifier U1. Diodes D1 and D2 limit amplifier output to 0.4 volts above and below the midpoint of 2.5 volts. The output of U1 is divided by resistors R12 and R13 to yield an AC signal that can vary 0.025 volts above and below a voltage of 0.15625 volts. Capacitor C6 is used to couple the AC audio component which will be used to modulate the carrier frequency produced by U3.

The carrier frequency is determined by the voltage applied to pin 3 of U3, and by the inductor L1. The voltage divider comprised of R6, R18 and R19 determine the highest voltage that will be supplied to a second voltage divider comprised of R17 and R20. The potentiometer R18 can vary this upper voltage limit by approximately 0.6 volts which provides the fine tuning capability of the FM transmitter. Capacitor C4 and resistor R6 provide additional filtering of the voltage supplied to the top of potentiometer R18. The second voltage divider comprised of potentiometer R17 and resistor R20 provide the course tuning voltage to the FM transmitter. This tuning voltage is applied to the high impedance input pin 3 of U3.

The tuning voltage from the voltage dividers described above is modulated by the audio signal from capacitor C6. Resistor R4 and capacitor C1 comprise a single-pole low pass filter with a cutoff frequency of 3000 Hz to reduce feedback at higher frequencies. Resistor R8 provides additional impedance for capacitor C6 when potentiometer R17 is adjusted close to the bottom of it's range. Capacitor C1 also provides bypassing of circuitry inside U3. Inductor L1 is used by U3 to set the frequency range of U3. Resistors R1 and R2 are pull-up resistors for the non-inverted and inverted outputs of U3. Only the non-inverted output is used. Capacitor C2 is used to provide DC decoupling to the antenna which is the shield wire in the three wire power cable connected to microphone/earphone jack. This antenna wire is not used as a power wire but is unconnected at the microphone/earphone jack end. The antenna/microphone cable should be approximately 12-18 inches in length.

A heating circuit is comprised of integrated circuit U2, resistors R14, R15, and R16 and transistor Q1. This heating circuit is used to keep U3 at approximately 100 degrees Fahrenheit for frequency stability. Resistor R14 sets the temperature threshold. Resistor R15 limits current to the base of Q1. Resistor R16 is a 1/2 watt resistor that is used as the heating element. R16 is placed over top of, and in contact with, U2. In order for the heat to be dispersed to U3 a drop of potting epoxy is applied to cover U2, R16 and U3.

A voltage conditioning and regulating circuit is also used comprising FR1, L2, C5, U4, C9 and C10. Fuse FR1 is a surface mount, resettable, 50 milliamp fuse. Currents greater than 100 milliamps will cause the fuse to go into a high impedance state limiting current to the board. Inductor L2 and capacitor C5 provide noise filtering of the 12-volt power. Filtered power is supplied to the input of the 5-volt regulator U4. Capacitors C9 and C10 are used for bypassing the 5-volt power supply. Capacitor C9 is located near the supply pins of U3. R21 and LED D3 are for power on indication.

Resistor R7 is a 0 ohm resistor used as a jumper to facilitate the layout of the printed circuit board.

In one embodiment, the circuit shown in FIG. 3 is disposed on a circuit board (e.g., a PCB) that plugs into a power outlet such as a cigarette lighter in an automobile. A wire extends from a microphone worn by a user to the circuit board. The circuit board modulates the audio signal onto an FM carrier frequency. The circuit board transmits at a high enough power level for a locally tuned radio to receive the modulated audio signal and playback the audio signal on speakers, in for example, a corresponding vehicle.

VEHICLE COMMUNICATION SYSTEM

Description

1. Technical Field

The invention relates generally to a vehicle communication system and, more specifically, to a vehicle communication system which can be utilized in a large automobile, minivan, SUV, or the like, where it can be difficult to communicate between persons sitting in the front seat of the vehicle and those sitting behind the front seat.

2. Background of Related Art

During the past years, vehicles of increasingly larger size have gained popularity. In such vehicles it is typical to have two or more rows of seats for seating five or more passengers behind the driver. In these vehicles, as with other vehicles, the driver must face forward in the direction of travel of the vehicle. Thus, the driver faces away from the seated occupants who can be seated two rows behind the front seat. Consequently, it is difficult for the driver and other front seat passenger to communicate with those persons located in the rear of the vehicle. Likewise, it is difficult for the passengers located in the rear to hear the driver.

It is known to use a microphone in the front or rear seating area to pick up voices which are then amplified and reproduced by speaker in another seating area. One problem which has been encountered with such systems is acoustic feedback between the speaker and closely spaced microphone located at each occupant. Microphone reception and related vehicles noise is generally re-transmitted through the microphone in speakers located within the passenger seating area, thereby further degrading communications. Also known are audio communication systems including a plurality of microphone and speaker combinations located within the passenger seating area, combined with a digital signal processor that simultaneously outputs the signals of each microphone through all the attached speakers. The digital signal processor is utilized to substantially eliminate unwanted external interference and feedback, while also allowing duplex

communication between passengers and the driver. Each microphone and speaker combination can be integrated into the existing audio entertainment subsystems such as a radio, found in the majority of modern vehicles. While such systems are an improvement over previous designs, they still may suffer from transmission problems during use. There is, therefore, needed in the art an improved vehicle communication system which allows for communication between a driver and his or her passengers in an efficient and clear manner.

Summary

The vehicle communication system described herein receives and amplifies a voice signal inside of a vehicle, for example, an automobile, and transmits these signals through a compact disk cassette adapter or an amplified speaker. In this manner, communication between the driver and passengers of the vehicle is facilitated.

Brief Description of the Drawings

It should be understood that the drawings are provided for the purpose of illustration only and are not intended to define the limits of the invention. The foregoing and other objects and advantages of the embodiments described herein will become apparent with reference to the following detailed description when taken in conjunction with the accompanying drawings in which:

Fig. 1 is a schematic diagram of the circuit for the vehicle communication system of the present invention; and

Fig. 2 is a schematic diagram of an amplified speaker for use with the circuit of Fig. 1.

Detailed Description of the Illustrative Embodiments

Referring now to Figs. 1-2, an exemplary embodiment for the vehicle communication system described herein is shown. The system includes a microphone 10, of known specifications, which is designed to receive voice signals from a person sitting closest to the microphone, whether in the front or rear seats of the vehicle. In the present embodiment, the microphone is preferably an electret cartridge, although other conventional microphones may be

utilized as would be known to one of skill in the art. The microphone 10 is preferably capacitively coupled to a low noise operational amplifier in order to amplify the output from the microphone. The low noise operational amplifier preferably includes an AC gain set at about 20, with only one of the amplifiers on the dual integrated circuit preferably being used. In the present embodiment, the output of the amplifier is preferably DC coupled to a phase shifting network 12. In the present embodiment the phase shifting network may preferably be made of two JFET transistors, a single capacitor and a single potentiometer, and is preferably capable of providing phase shift of up to approximately 180 degrees. The phase shifting network is preferably adjusted to provide approximately 90 degrees of phase shift in order to improve the amplifier phase margin and reduce the possibility of audio feedback during use.

The audio output of the network of the present embodiment is directed through a slide potentiometer which serves as a volume control 14. The resulting signal is used to drive a compact disc cassette adapter 16 or an amplified speaker 18 (Fig. 2). The cassette adapter 16 allows the user to play the amplified voice signals through the auto's cassette player and to adjust the output accordingly. For example, in the embodiment of Fig. 1, the user would insert the adapter into the cassette player and adjust the volume and balance for the best sound without feedback. Alternately, if the user prefers not to use the car stereo, he or she may then use an amplified speaker as shown schematically in Fig. 2, in order to listen to the audio output.

It will be understood that various modifications may be made to the embodiment disclosed herein. Therefore, the above description should not be construed as limiting, but merely as exemplifications of a preferred embodiment. Those skilled in the art will envision other modifications within the scope spirit of the invention.

I CLAIM: